WHAT IS CLAIMED IS:

1. A system for controlling a gas-turbine engine having a combustor which is supplied with air drawn in and compressed by a compressor and gas fuel supplied from a gas fuel supply source and which generates a combustion such that resulting combustion gas rotates a turbine that is connected to the compressor and a load to drive the compressor and the load, comprising:

fuel regulating means for regulating a flow rate of the gas fuel to be supplied to the combustor;

air flow rate detecting means for detecting a flow rate of the air to be supplied to the combustor;

oxygen concentration sensor for detecting oxygen concentration of the resulting combustion gas; and

calorific value calculating means for calculating a calorific value generated by the combustion in the combustor based on at least the detected flow rate of the air and the oxygen concentration;

wherein the fuel regulating means regulating the flow rate of the gas fuel to be supplied to the combustor based on the calculated calorific value.

2. A system according to claim 1, wherein the fuel regulating means includes:

premix combustion generating means for mixing the air and the gas fuel and for generating an air-fuel mixture to be supplied to the combustor such that a premix combustion is generated;

diffusive combustion generating means for supplying the air and the gas fuel separately to the combustor such that a diffusive combustion is generated;

adiabatic flame temperature calculating means for calculating an adiabatic flame temperature generated by the combustion indicative of an inlet temperature of the turbine based on at least the detected oxygen concentration; and

combustion selecting means for selecting one of the premix combustion generating means and the diffusive combustion generating means based on at least the calculated adiabatic flame temperature.

3. A system according to claim 1, wherein the fuel regulating means includes:

premix combustion generating means for mixing the air and the gas fuel and for generating an air-fuel mixture to be supplied to the combustor such that a premix combustion is generated;

diffusive combustion generating means for supplying the air and the gas fuel separately to the combustor such that a diffusive combustion is generated;

operating condition detecting means for detecting operating condition of the engine; and

combustion selecting means for selecting one of the premix combustion generating means and the diffusive combustion generating means based on the detected operating condition of the engine.

4. A system according to claim 1, wherein the calorific value calculating means includes:

calorific value per unit air amount calculating means for calculating a calorific value per unit amount of the air based on the detected oxygen concentration;

and determines the calorific value by multiplying the calorific value per unit amount of the air by the detected flow rate of the air.

5. A system according to claim 2, wherein the calorific value calculating means includes:

calorific value per unit air amount calculating means for calculating a calorific value per unit amount of the air based on the detected oxygen concentration;

and determines the calorific value by multiplying the calorific value per unit amount of the air by the detected flow rate of the air.

6. A system according to claim 1, wherein the fuel regulating means includes a feedback control loop having:

desired calorific command value determining means for determining a desired calorific command value to be generated by the combustion based on the load;

gas fuel flow rate controlling means for controlling the flow rate of the gas fuel based on the determined desired calorific command value;

error calculating means for calculating an error between the determined desired calorific command value and the calculated calorific value; and

desired calorific command value correcting means for correcting the determined desired calorific command value based on the calculated error.

7. A system according to claim 2, wherein the fuel regulating means includes a feedback control loop having:

desired calorific command value determining means for determining a desired calorific command value to be generated by the combustion based on the load;

gas fuel flow rate controlling means for controlling the flow rate of the gas fuel based on the determined desired calorific command value;

error calculating means for calculating an error between the determined desired calorific command value and the calculated calorific value; and

desired calorific command value correcting means for correcting the determined desired calorific command value based on the calculated error.

8. A system according to claim 6, wherein the gas fuel flow rate controlling means comprises a fuel control valve and includes;

valve opening calculating means for calculating an opening of the fuel control valve in accordance with a predetermined characteristic preset relative to the desired calorific command value;

and controls the flow rate of the gas fuel based on the determined opening of the valve.

9. A system according to claim 7, wherein the gas fuel flow rate controlling means comprises a fuel control valve and includes;

valve opening calculating means for calculating an opening of the fuel control valve in accordance with a predetermined characteristic preset relative to the desired calorific command value;

and controls the flow rate of the gas fuel based on the determined opening of the valve.

10. A system for controlling a gas-turbine engine having a combustor which is supplied with an air-fuel mixture made up of air drawn in through an air intake and supplied through an air passage while being compressed by a compressor and gas fuel supplied through a fuel supply passage from a gas fuel supply source and which generates a combustion such that resulting combustion gas rotates a turbine that is connected to the compressor and a load to drive the compressor and the load, comprising:

fuel regulating means provided at the fuel supply passage for regulating a flow rate of the gas fuel to be supplied to the combustor;

a venturi tube having an inlet end connected to the air passage and an outlet end opened into the combustor, the venturi tube having a throat of a predetermined sectional area at a location between the inlet end and the outlet end;

gas fuel jetting means having an inlet end connected to the fuel supply passage at a location downstream of the fuel regulating means and an outlet end connected to the throat of the venturi pipe, the gas fuel jetting means having an orifice of a predetermined opening area which jets the gas fuel supplied from the fuel supply passage into the air passing the throat to form the air-fuel mixture to be supplied to the combustor;

gas fuel mass flow rate calculating means for calculating a mass flow rate of the gas fuel passing through the orifice;

gas fuel temperature detecting means for detecting a temperature of the gas fuel;

gas fuel pressure detecting means for detecting a pressure of the gas fuel;

venturi inlet air temperature detecting means for detecting an inlet temperature of the air flowing into the venturi pipe;

venturi inlet air pressure detecting means for detecting an inlet pressure of the air flowing into the venturi pipe;

air mass flow rate calculating means for calculating a mass flow rate of the air passing through the throat based on the calculated mass flow rate of the gas fuel, the detected gas fuel temperature and the pressure, the detected inlet air temperature and the pressure, the predetermined sectional area of the throat, and the predetermined opening area of the orifice; and

fuel supply control means for controlling supply of the gas fuel through the fuel regulating means based on the calculated flow rates of the gas fuel and the air.

11. A system according to claim 10, wherein a plurality of the gas fuel jetting means and the venturi tubes are provided such that they form a multiple venturi mixer.

12. A system for controlling a gas-turbine engine having a combustor which is supplied with an air-fuel mixture made up of air drawn in through an air intake and supplied through an air passage while being compressed by a compressor and gas fuel supplied

through a fuel supply passage from a gas fuel supply source and which generates a combustion such that resulting combustion gas rotates a turbine that is connected to the compressor and a load to drive the compressor and the load, comprising:

fuel regulating means provided at the fuel supply passage for regulating a flow rate of the gas fuel to be supplied to the combustor;

a venturi tube having an inlet end connected to the air passage and an outlet end opened into the combustor, the venturi tube having a throat of a predetermined sectional area at a location between the inlet end and the outlet end;

gas fuel jetting means having an inlet end connected to the fuel supply passage at a location downstream of the fuel regulating means and an outlet end connected to the throat of the venturi pipe, the gas fuel jetting means having an orifice of a predetermined opening area which jets the gas fuel supplied from the fuel supply passage into the air passing the throat to form the air-fuel mixture to be supplied to the combustor; and

fuel supply control means for controlling supply of the gas fuel through the fuel regulating means;

wherein a ratio of the predetermined sectional area of the throat and the predetermined opening area of the orifice is set to a predetermined value.

13. A system according to claim 12, wherein the predetermined value is a desired air/fuel ratio based on which the fuel supply control means control the supply of the gas fuel.

14 . A system according to claim 13, further including:

predetermined value correcting means for correcting the predetermined value based on a ratio of densities of the air and the gas fuel.

15. A system according to claim 12, further including:

gas fuel mass flow rate calculating means for calculating a mass flow rate of the gas fuel passing through the orifice;

gas fuel temperature detecting means for detecting a temperature of the gas fuel;

gas fuel pressure detecting means for detecting a pressure of the gas fuel;

venturi inlet air temperature detecting means for detecting an inlet temperature of the air flowing into the venturi pipe;

venturi inlet air pressure detecting means for detecting an inlet pressure of the air flowing into the venturi pipe; and

air mass flow rate calculating means for calculating a mass flow rate of the air passing through the throat based on the calculated mass flow rate of the gas fuel, the detected gas fuel temperature and the pressure, the detected inlet air temperature and the pressure, the predetermined sectional area of the throat, and the predetermined opening area of the orifice;

wherein the fuel supply control means controls the supply of the gas fuel through the fuel regulating means based on the calculated flow rates of the gas fuel and the air.

16. A method of controlling a gas-turbine engine having a combustor which is supplied with air drawn in and compressed by a compressor and gas fuel supplied from a gas fuel supply source and which generates a combustion such that resulting combustion gas rotates a turbine that is connected to the compressor and a load to drive the compressor and the load, comprising the steps of:

(a) regulating a flow rate of the gas fuel to be supplied to the combustor;

(b) detecting a flow rate of the air to be supplied to the combustor;

(c) detecting oxygen concentration of the resulting combustion gas; and

(d) calculating a calorific value generated by the combustion in the combustor based on at least the detected flow rate of the air and the oxygen concentration;

wherein the step (a) regulating the flow rate of the gas fuel to be supplied to the combustor based on the calculated calorific value.

17. A method according to claim 16, wherein the step (a) includes the steps of:

(e) mixing the air and the gas fuel and for generating an air-fuel mixture to be supplied to the combustor such that a premix combustion is generated;

(f) supplying the air and the gas fuel separately to the combustor such that a diffusive combustion is generated;

(g) calculating an adiabatic flame temperature generated by the combustion indicative of an inlet temperature of the turbine based on at least the detected oxygen concentration; and

(h) selecting one of the step (e) and the step (f) based on at least the calculated adiabatic flame temperature.

18. A method according to claim 16, wherein the step (a) includes the steps of:

(i) mixing the air and the gas fuel and for generating an air-fuel mixture to be supplied to the combustor such that a premix combustion is generated;

(j) supplying the air and the gas fuel separately to the combustor such that a diffusive combustion is generated;

(k) detecting operating condition of the engine; and

(l) selecting one of the step (i) and the step (j) based on the detected operating condition of the engine.

19. A method according to claim 16, wherein the step (d) includes the step of:

(m) calculating a calorific value per unit amount of the air based on the detected oxygen concentration;

and determines the calorific value by multiplying the calorific value per unit amount of the air by the detected flow rate of the air.

20. A method according to claim 17, wherein the step (d) includes the step of:

(n) calculating a calorific value per unit amount of the air based on the detected oxygen concentration;

and determines the calorific value by multiplying the calorific value per unit amount of the air by the detected flow rate of the air.

21. A method according to claim 16, wherein the step (a) includes a feedback control loop having the steps of:

(o) determining a desired calorific command value to be generated by the combustion based on the load;

(p) controlling the flow rate of the gas fuel based on the determined desired calorific command value;

(q) calculating an error between the determined desired calorific command value and the calculated calorific value; and

(r) correcting the determined desired calorific command value based on the calculated error.

22. A method according to claim 17, wherein the step (a) includes a feedback control loop having the steps of:

(s) determining a desired calorific command value to be generated by the combustion based on the load;

(t) controlling the flow rate of the gas fuel based on the determined desired calorific command value;

(u) calculating an error between the determined desired calorific command value and the calculated calorific value; and

(v) correcting the determined desired calorific command value based on the calculated error.

23. A method according to claim 21, wherein the step (q) includes the step of;

(w) calculating an opening of a fuel control valve in accordance with a predetermined characteristic preset relative to the desired calorific command value;

and controls the flow rate of the gas fuel based on the determined opening of the valve.

24. A method according to claim 22, wherein the step (t) includes the step of;

(x) calculating an opening of a fuel control valve in accordance with a predetermined characteristic preset relative to the desired calorific command value;

and controls the flow rate of the gas fuel based on the determined opening of the valve.